
ABSTRACT

A twin-wire arc deposition method for depositing a nano-structured catalyst coating onto a solid electrolyte membrane or an electrode substrate from a precursor catalyst material selected from the group consisting of a metal, metal alloy, metal compound, and ceramic material. The method includes the steps of (a) providing an ionized arc nozzle comprising two consumable electrode and a working gas flow to form an ionized arc between the two electrodes, wherein the consumable electrodes provide the precursor catalyst material vaporizable therefrom by the ionized arc; (b) operating the arc nozzle to heat and at least partially vaporize the precursor catalyst material for providing a stream of nanometer-sized vapor clusters of the precursor catalyst material into a chamber in which the membrane or the electrode substrate has been placed; and (c) introducing a stream of a carrier gas into the chamber to impinge upon the stream of precursor vapor clusters to produce depositable nano clusters which are carried by the carrier gas to deposit onto a first side of the membrane or the electrode substrate for forming the nano-structured catalyst coating. Such a catalyst-coated membrane or electrode can be incorporated as a part of a fuel cell.